



6712-01

FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 1, 2, 15, 18, 22, 24, 25, 27, 73, 90, 95, 97, and 101

[ET Docket Nos. 03-137 and 13-84, FCC 19-126; FRS 16453]

Human Exposure to Radiofrequency Electromagnetic Fields and Reassessment of FCC

Radiofrequency Exposure Limits and Policies

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: In this document, the Federal Communications Commission (Commission) amends its rules related to the two methods that may be used for determining and achieving compliance with the Commission's existing limits on human exposure to radiofrequency (RF) electromagnetic fields: *exemption* – consideration of whether a particular device or deployment is so clearly compliant, based on criteria in the Commission's rules, that it qualifies as exempt from the requirement to undertake a more thorough RF exposure analysis – and *evaluation* – a more specific examination of an individual site or device, which considers factors beyond those utilized for exemption and may be performed with a variety of computational and/or measurement methodologies. It also amends the rules related to an increasingly important part of demonstrating and maintaining RF exposure compliance: *mitigation* – the restriction from or limitation of RF exposure in controlled areas to keep RF exposure within the Commission's established limits by, for example, using signs or barriers. The amended rules are

intended to provide more efficient, practical, and consistent RF exposure evaluation procedures and mitigation measures to help ensure compliance with the existing RF exposure limits. The amended rules replace the various inconsistent service-specific criteria for exempting parties from performing an evaluation to demonstrate compliance with the RF exposure limits with new, streamlined criteria. The amended rules also allow the use of any valid computational method to determine potential RF exposure levels, remove the minimum evaluation distance requirement for frequencies above 6 GHz, and establish post-evaluation RF exposure mitigation procedures (*e.g.*, signage), to help ensure that persons are not exposed to RF emissions in excess of the existing limits. The Commission also affirms its prior decision to classify the pinna (outer ear) as an extremity in RF exposure compliance testing, finds no appropriate basis for and thus declines to propose amendments to existing RF exposure limits at this time, and terminates the inquiry in which it sought comment on the Commission's existing guidelines for limiting RF exposure to humans.

DATES: Effective [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

FOR FURTHER INFORMATION CONTACT: Martin Doczkat, email: martin.doczkat@fcc.gov; the Commission's RF Safety Program, rfsafety@fcc.gov; or call the Office of Engineering and Technology at (202) 418-2470.

SUPPLEMENTARY INFORMATION: This is a summary of the Commission's *Second Report and Order, Memorandum Opinion and Order, and Termination of Notice of Inquiry*, ET Docket No. 03–137, ET Docket No. 13–84, FCC 19–126, adopted November 27, 2019 and released

December 4, 2019. The full text of this document is available for public inspection and copying during normal business hours in the FCC Reference Center (Room CY–A257), 445 12th Street SW, Washington, DC 20554, or by downloading the text from the Commission’s Web site at <https://www.fcc.gov/edocs/daily-digest/2019/12/05>. Alternative formats are available for people with disabilities (Braille, large print, electronic files, audio format) by sending an email to fcc504@fcc.gov or calling the Commission’s Consumer and Governmental Affairs Bureau at (202) 418–0530 (voice), (202) 418–0432 (TTY).

Synopsis

I. INTRODUCTION

1. On March 27, 2013, the Commission adopted a First Report and Order (First RF Report and Order), Further Notice of Proposed Rulemaking (2013 RF Further Notice), and Notice of Inquiry (2013 RF Inquiry) in this proceeding, 78 FR 33654, June 4, 2013. In the 2019 Second Report and Order, the Commission simplified the regulatory framework for determining compliance with the Commission’s existing RF exposure limits by providing more efficient, practical, and consistent RF exposure exemption criteria, evaluation procedures, and mitigation measures to help ensure compliance with the RF exposure limits. In the 2019 Memorandum Opinion and Order, the Commission affirmed its decision in the First RF Report and Order to classify in its rules the pinna (outer ear) as an extremity for RF exposure compliance testing. In the 2019 Termination of Notice of Inquiry, the Commission terminated the 2013 RF Inquiry that sought comment on the efficacy and propriety of the Commission’s existing guidelines and policies for limiting RF exposure to humans, finding no appropriate basis for and thus declining to propose amendments to existing limits at this time. The following are the major actions that the Commission took in the 2019 Second Report and Order to simplify the Commission’s RF exposure evaluation procedures and mitigation measures and apply them consistently:

- Created three broad categories for exemption from the RF exposure evaluation requirements for all fixed, mobile, and portable RF sources, based on power, separation distance (minimum distance in any direction from any part of a radiating structure to any part of the human body), and frequency, that provide for both single- and multiple-transmitter cases and treat like sources similarly regardless of the underlying service; adopted the term “exemption” to replace “exclusion” for this topic.
- Added to § 1.1307(b) of the Commission’s rules a set of technical definitions related to output power, separation distance, RF exposure scenarios and sources, and categories for specifying RF safety program actions that reflect potential RF exposure scenarios.
- Replaced restrictive and outdated provisions that specified only a single acceptable numerical approach to RF exposure evaluation, with provisions allowing the use of any valid computational method to determine RF exposure levels; allowed parties to make *ad hoc* requests for use of other RF exposure evaluation methods whose reliability and validity can be substantiated.
- Removed from § 2.1093(d) of the Commission’s rules the 5-cm minimum separation specification for measurements and calculations used to demonstrate RF exposure compliance for devices that operate above 6 GHz.
- Established more specific post-evaluation RF exposure mitigation measures that include access control, signage, and training requirements for transmitter sites where RF exposure limits may be exceeded to help ensure that persons are not exposed to RF emissions that exceed the Commission’s established RF exposure limits.

II. DISCUSSION

Second Report and Order

2. In the 2019 *Second Report and Order*, the Commission amended parts 1, 2, 15, 18, 22, 24, 25, 27, 73, 90, 95, 97, and 101 of its rules to simplify the procedures for determining compliance with the Commission's existing RF exposure limits to help ensure consistent compliance with those limits. These actions are described in greater detail below.

A. Exemptions from the RF Exposure Evaluation Requirement

3. As proposed in the 2013 *RF Further Notice* and supported in the record, the Commission revised the various service-specific criteria for exemption (formerly termed exclusion) from performing an RF exposure evaluation, to set forth a single, generally-applicable set of formulas based on power, separation distance, and frequency of fixed, mobile, and portable transmitters that are applicable to both single and multiple sources of RF emissions, and adopted a set of technical definitions related to output power and separation distance. The Commission adopted three broad classes of RF exemptions: 1) for extremely low-power devices that transmit at no more than 1 mW; 2) for somewhat higher-power devices with transmitting antennas that normally operate within 0.5 cm to 40 cm of the human body in the frequency range between 300 MHz and 6 GHz, a formula based primarily on the localized specific absorption rate (SAR) limits; and 3) for all other transmitters, based on a set of formulas for maximum permissible exposure (MPE) limits. The new exemption criteria apply to all of the Commission's rules authorizing RF sources. Under the new rules, every applicant for equipment authorization and every licensee prior to deployment or commencement of operations may determine whether the device or transmitter falls under one of the classes of exemptions. If the device or transmitter falls under one of these classes of exemption, no additional action is necessary. If not, the applicant or licensee will have to perform a routine evaluation to determine compliance with the existing RF exposure limits. The Commission reasoned that this new process would not impose any

significant burdens on impacted parties since the underlying exposure rules and parties' obligations under the rules remain the same; the new rules only modify the process used to demonstrate compliance.

4. In response to comments that the rule changes are unnecessary and will be burdensome and some parties may lose their service-based exemptions, the Commission noted that unlike in the past, fixed RF communications equipment is now located on rooftops that are accessible to the public and on other structures near ground level that are not spatially removed from publicly accessible areas at similar heights. To achieve consistently reliable compliance with the existing RF exposure limits, the Commission decided that these sorts of installations warrant an affirmative determination of compliance with the RF exposure requirements.

1. Exemption Criteria – Single RF Source.

5. A single RF source will be exempt from RF exposure evaluation under any one of three circumstances: 1) the RF source transmits at no more than 1 mW time-averaged available (matched conducted) power; 2) the RF source is normally separated between 0.5 and 40 cm from the human body, in the frequency range between 300 MHz and 6 GHz, and transmits at no more than the average power threshold result from the formula the Commission adopted based on the localized SAR limits; or, 3) for all other fixed, mobile, and portable transmitters, the RF source transmits at no more than the average power threshold result from the set of formulas the Commission adopted based on the MPE limits at separation distances from any part of the radiating structure of at least $\lambda/2\pi$ (RF signal free-space wavelength divided by 2π) in all service categories.

6. *1-mW Blanket Exemption.* For extremely low-power fixed, mobile, and portable RF sources, the Commission adopted a blanket RF exposure evaluation exemption for a single transmitter operating with up to 1 mW of time-averaged available (matched conducted) power, irrespective of the separation distance from the human body. The 1-mW exemption is independent of service type and covers the full frequency range from 100 kHz to 100 GHz, but it may not be used in conjunction with other exemption criteria, or in devices with higher-power transmitters operating in the same time-averaging period. The 1-mW blanket exemption applies for any separation distance, including distances of less than 0.5 cm and where there is no separation, *e.g.*, medical implant devices.

7. *SAR-Based Exemption.* For fixed, mobile, and portable RF sources near a human body, where the separation distance is normally between 0.5 and 40 cm and may be less than $\lambda/2\pi$, the Commission adopted the new RF exposure evaluation exemption formula shown here for time-averaged power thresholds (specified in mW) for exemption of single portable, mobile, and fixed RF sources at 0.3-6 GHz. A source is exempt if each of the maximum time-averaged available (matched conducted) power and effective radiated power (ERP) is no more than:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}}(d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

8. The formula provides, as a function of separation distance and frequency, a threshold power below which a single RF source is exempt from further RF exposure evaluation. It applies to fixed, mobile, and portable RF sources in any service at a separation distance between 0.5 cm and 40 cm from the body, and is applicable in the frequency range from 300 MHz through 6 GHz. The SAR-based thresholds are derived based on the frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

9. If the ERP of a device is not easily determined, such as for a portable device with a small form factor, available maximum time-averaged power (i.e., maximum power delivered into a matched antenna, considering line loss or any other loss that diminishes the power delivered to an antenna) may be used exclusively if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$. A coherent phased array of antenna elements is to be treated as a single antenna or RF source with separation distance determined from the nearest antenna element.

10. For devices with antennas of length greater than $\lambda/4$ where the gain is not well-defined but always less than that of a half-wave dipole, the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, in

situations where that ERP value is not known. This would apply, for instance, to “leaky” coaxial distribution systems, RF heating equipment, and other typically unintentionally radiating or Industrial, Scientific and Medical (ISM) devices. The SAR-based exemption threshold, P_{th} , is defined in terms of maximum time-averaged power and in accordance with the source-based time-averaging requirements described in § 2.1093(d)(5) of the rules. Time-averaged power measurements are necessary to determine if the maximum output of a transmitting antenna (ERP) or matched conducted transmitter power is above the proposed threshold for exemption from routine SAR evaluation. The Commission’s Office of Engineering and Technology (OET) will publish in its Knowledge Database (KDB) the power measurement and SAR test procedures necessary to demonstrate compliance with the RF exposure limits.

11. While commenters supported the basic idea of a uniform formula for an SAR exemption, several commenters disagreed with the proposed formula, contending it was overly conservative and inconsistent with the operation of current devices. Instead, parties supported use of the International Electrotechnical Commission’s (IEC’s) standard IEC 62479 (2010), which provides alternative recommendations for exemption of low-power devices based on SAR. For several reasons, the Commission was not persuaded that the IEC standard was appropriate. Even though the IEC’s standard uses dipoles and flat phantoms as a starting point for modeling, and is applicable to the same frequency range as the SAR exemption formula (300 MHz-6 GHz), the Commission determined that the IEC standard departs significantly regarding the applicable range of separation distances and use of bandwidth, with an increased complexity in the resulting formulas. In addition, the IEC model does not directly incorporate antenna directivity and states that it may not apply to devices with highly directive antennas. To maintain

simplicity, the Commission limited the exemptions to those based solely on the relationship of power (both available or matched power and ERP), separation distance, and frequency, without other inputs – such as antenna pattern or bandwidth – that would effectively render an exemption determination as complex as an evaluation. It concluded that additional complexity in the exemptions from additional inputs would result in regulations that were of little or no practical utility as a simple exemption protocol; additional factors could be considered as needed or appropriate in a more thorough evaluation to demonstrate compliance. The Commission also declined to extend the SAR-based exemption formula from 0.5 cm to 0 cm because there is no modeling data that validates such an extension.

12. *MPE-Based Exemption.* To support an exemption from further evaluation for frequencies from 300 kHz through 100 GHz, the Commission also adopted general frequency and separation-distance dependent MPE-based ERP thresholds as shown below in Table 2. The values in Table 2 apply to any single RF source (*i.e.*, fixed, mobile, and portable transmitters) and specify power and separation distance criteria for each of the five frequency ranges used for the MPE limits.

Table 2. Single RF Sources Subject to Routine Environmental Evaluation under

MPE-Based Exemptions

Transmitter Frequency (MHz)	Threshold ERP (watts)
0.3 – 1.34	1,920 R ²
1.34 – 30	3,450 R ² /f ²

30 – 300	$3.83 R^2$
300 – 1,500	$0.0128 R^2 f$
1,500 – 100,000	$19.2 R^2$
Note: R is in meters and f is in MHz.	

13. An RF source with ERP equal to or less than the Threshold ERP specified in Table 2 for the source frequency would be considered exempt from evaluation. In cases where ERP is not well defined, the available maximum time-averaged power may be used if the device antenna(s) or radiating structure(s) does not exceed an electrical length of $\lambda/4$. The separation distance R is the smallest distance from any part of the antenna or radiating structure to all persons, including those occupationally exposed, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance R is from the outer housing of the device where it is closest to the antenna. At sites with multiple fixed transmitters, or multiple mobile or portable transmitters within the same device, the formulas would be applied in conjunction with the summations discussed in the section below on RF Exposure Evaluation Exemption Criteria – Multiple RF Sources.

14. The criteria shown in Table 2 apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$; if R is less than $\lambda/2\pi$ and other exemptions do not apply, evaluation is required. Since $\lambda/2\pi$ is greater than 20 cm at frequencies below 239 MHz, these exemption criteria do not apply to portable devices that are operated both at less than 20 cm from the human body and at frequencies below 239 MHz. In general, less restrictive SAR-based

exemption criteria may be used in accordance with the formulas specified in Table 2, but these SAR-based exemptions are not valid below 300 MHz. Thus, there are no exemption criteria below 239 MHz for portable devices (or for any antenna at less than 20 cm), other than the 1 mW blanket exemption.

15. The Commission declined to adopt commenters' suggestions to adjust the formulas to more readily exempt transmitters mounted on dedicated, access-controlled wireless support structures in the frequency range 300 MHz to 3 GHz because simply being building-mounted does not preclude persons from having access to the area near an antenna, particularly when mounted low to the ground or in other accessible locations. The actual distance from potential human presence should be taken into consideration. The Commission rejected a commenter's proposal to relax the standard for transmitters located on structures where access can be more readily controlled since spaces adjacent to such a structure may be readily accessible, rendering the transmitter appropriate for an evaluation. It also rejected a commenter's proposal to add a modified exemption formula that would apply between 400 MHz and 3 GHz because it found that the formula was based on inappropriate assumptions and could not ensure compliance with the Commission's RF exposure limits.

2. RF Exposure Evaluation Exemption Criteria – Multiple RF Sources.

16. *1-mW Exemption.* For multiple sources inside a single device, each of which is capable of no more than 1-mW, the Commission adopted a minimum 2-cm separation distance between antennas that operate in the same time-averaging period, as proposed in the *2013 RF Further Notice*. In other words, if there are two or more RF sources inside a single device operating at the same time and the nearest parts of the antenna structures are separated by

less than 2 cm, the 1-mW exemption will not apply. However, if the sum of multiple sources is less than 1 mW during the time-averaging period, they may be treated as a single source (separation is not required), and exempted accordingly. As with the exemption for a single RF source, this exemption cannot be used in conjunction with other exemption criteria, and medical implant devices may use only this 1-mW exemption.

17. *Use of Summation Formulas.* In situations where RF exposure is generated from multiple sources at the same time, all such sources are considered in aggregate to determine compliance with the exposure limits. The Commission decided that the SAR- and MPE-based exemptions from RF exposure evaluation may be used along with known existing exposure levels to exempt multiple RF sources. This is accomplished by normalizing each source power level to each matching exemption threshold power and determining whether the total of all the normalized powers is no more than 1. (Normalization here means dividing an RF source power level by the corresponding exemption threshold power.) In addition, if pre-existing exposure levels are known, they may also be normalized to the exposure limits to determine the remaining margin available for exemption of additional sources to demonstrate compliance with the limit. These concepts are applied to the antennas of multiple transmitters in a single device and to multiple fixed transmitters, as explained below.

18. *Multiple RF Sources with Fixed Physical Relationship.* To address the potential exposure from multiple simultaneously operating RF sources with a fixed physical relationship, the Commission adopted the summation formula shown below for all RF sources, regardless of whether portable, mobile, or fixed, rather than its proposals in the *2013 RF Further Notice*, which provided different formulas for portable, mobile, and fixed transmitters. For sites or

devices with multiple transmitters, the summation formula shown below will determine whether multiple transmitters using the single transmitter formulas are collectively exempt from evaluation. This formula includes three summation terms, the first two of which are summations for the exemptions, the third is to account for exposure from existing evaluations, which is described in more detail below.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

where

- a* equals the number of fixed, mobile, or portable RF sources claiming exemption using the Table 1 formula for P_{th} , including existing exempt transmitters and those being added.
- b* equals the number of fixed, mobile, or portable RF sources claiming exemption using the applicable Table 2 formula for Threshold ERP, including existing exempt transmitters and those being added.
- c* equals the number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance.
- P_i equals the available maximum time-averaged power or the ERP, whichever is greater, for a fixed, mobile, or portable RF source *i* at a distance between 0.5 cm and 40 cm (inclusive).

$P_{th,i}$ equals the exemption threshold power (P_{th}) according to the Table 1 formula for a fixed, mobile, or portable RF source i .

ERP_j equals the available maximum time-averaged power or the ERP, whichever is greater, of a fixed, mobile, or portable RF source j .

$ERP_{th,j}$ equals the exemption threshold ERP for a fixed, mobile, or portable RF source j , at a distance of at least $\lambda/2\pi$, according to the applicable Table 2 formula at the location in question.

$Evaluated_k$ equals the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation.

$Exposure\ Limit_k$ equals either the general population/uncontrolled maximum permissible exposure (MPE) limit or specific absorption rate (SAR) limit for each fixed, mobile, or portable source, as applicable.

19. The normalized contributions to the total exemption threshold can be determined by calculating for each RF source, whether mobile, portable, or fixed, the ratio of the maximum time-averaged power (matched conducted power or ERP, as appropriate) for the transmitter, comparing it to the appropriate frequency- and distance-dependent threshold, using the formula above for either time-averaged power thresholds (mW) for exemption of single portable, mobile and fixed RF sources, or Table 2, and summing those ratios. If the ratios for all transmitters in a device operating in the same time-averaging period are included in the total sum and this sum is no more than 1 (*i.e.*, 100 percent), the cumulative contributions do

not exceed the permissible limit and a location at a site or the device (*i.e.*, all transmitters within the device) are exempt from routine evaluation. The basic exemption criteria are contained in the *P* and *ERP* summation terms, while the *Evaluated/Exposure Limit* sum accounts for the preexisting exposure levels and correspondingly reduces the allowable margin remaining for exemption at the location of interest (*e.g.*, 20 cm for mobile RF sources). All transmitters must be considered, and all transmitters that can operate at the same time must be included in the summation of multiple transmitters. If a transmitter is subsequently proposed to be added under the Commission's permissive change authorization procedures for portable or mobile devices, a new calculation must be made including the additional transmitter.

20. In response to a commenter's suggestion that the Commission incorporate further technical definitions in its rules for terms used in the summation formula beyond those proposed in the *2013 RF Further Notice*, the Commission added definitions of "available maximum time-averaged power," "effective radiated power (ERP)," and "time-averaging period" to its rules. However, because the Commission's exemptions do not rely on delivered power but available power, it declined to adopt a definition for "delivered maximum time-averaged power." The Commission clarified that the delivered maximum time-averaged power would be the largest net power delivered or supplied to an antenna, as averaged over a time period not to exceed 30 minutes for fixed sources, or as averaged over a time period inherent from the device transmission characteristics for mobile and portable sources (also not to exceed 30 minutes).

21. To account for simultaneous transmissions while allowing for short time-averaging periods for non-overlapping transmissions, the Commission included short time-averaging periods for non-overlapping transmissions in its rules. It also clarified that multiple source summations require time averaging over an averaging period during which the maximum power is being transmitted, provided that summations (or measurements) performed using a shorter time-averaging period correspond to the maximum aggregate time-averaged SAR or power density of the multiple transmitters being summed (*i.e.*, accounting for maximum duty cycle, maximum transmitted power, overlapping transmission, *etc.*). Also, short time-averaging periods (*e.g.*, over one pulse at maximum power) may be selected to conservatively determine power and avoid the need to sum powers from multiple transmitters when transmissions from the different transmitters do not overlap in time. The values for P_i , ERP_j , and $Evaluated_k$, where applicable, are determined according to the source-based time averaging requirements of §§ 2.1093(d)(5) and 2.1091(d)(2) of the rules, and the sum of those values conservatively represents the total calculated exposure. The summation formula may be used even if some of the three terms do not apply (*i.e.*, where those terms would be zero). To the extent that overlapping transmissions may vary among individual products and host configurations, the Commission noted that applicants may want to consult device-specific procedures developed by the FCC Laboratory addressing the details of how to conduct evaluations and determine compliance with the RF exposure limits.

22. *RF Sources without Fixed Physical Relationships.* As proposed in the 2013 *RF Further Notice*, the Commission decided not to require applicants to account for multiple RF sources that have no fixed positional relationship between or among each other when

determining the availability of an exemption, as is typically the case between a mobile and a broadcast antenna or other fixed source, or between two mobile sources. There is no practical method to quantitatively establish exemption for multiple RF sources where there is no definite positional relationship between sources, such as between multiple mobile/portable devices or between such devices and fixed transmitters, and none were recommended by commenters.

23. Although commenters raised concerns about the impact of cumulative RF exposure, the Commission found that consideration of the typical spatial separation between RF sources diminishes the practical relevance of multiple spatially uncorrelated transmitters. Since exposure from fixed RF sources diminishes rapidly with distance and signal losses due to non-line-of-sight conditions, the Commission expects that exposure from portable or mobile devices near a person's body would generally be overwhelmingly more significant. The exposure from each portable or mobile device near a person will generally be highly localized and involve low total power absorption. The Commission expects that the locations of maximum SAR in the body from these portable and mobile RF sources are highly unlikely to overlap, and also that total power absorption will not result in significant contribution to whole-body average SAR. Thus, for multiple exempt RF sources without an inherent spatial relationship, regardless of their classification as fixed, mobile, or portable, the Commission concluded that it is very highly unlikely the localized or whole-body SAR limits would be exceeded. The Commission concluded that the summation of potential exposure due to spatially uncorrelated sources should not be routinely required and is consistent with all known compliance activities to date.

B. Environmental Evaluation

24. Where an exemption cannot be invoked, a routine environmental evaluation – described in the Commission’s rules as a “determination of compliance” – must be performed for fixed transmission sites where the exemptions are not met to ensure that the RF exposure limits are not exceeded in places that are accessible to humans. In most cases, such an evaluation is simple and generic and does not require a determination of the precise exposure level, only that it can be determined from available information that it must be less than the Commission’s limits. In other cases, the evaluation may require more precision regarding transmitter power and antenna distance from human-accessible spaces and, potentially, may be the basis for determining necessary measures to deter humans from entering otherwise accessible locations (*i.e.*, mitigation).

25. As proposed in the *2013 RF Further Notice* and supported in the record, the Commission removed provisions from its rules that specified only one acceptable numerical approach to RF exposure evaluation and instead allowed any valid computational method to be used. The Commission replaced the restrictive rules with guidance documents, such as in OET Bulletins and the KDB, which describe acceptable methods for certain applications. Plus, the Commission decided that parties can make *ad hoc* requests for use of other methods whose reliability and validity they can substantiate to the satisfaction of Commission staff. Also as proposed, the Commission eliminated a minimum measurement distance of 5 cm for devices operating above 6 GHz, since that requirement appears to have been rendered obsolete by technological developments and is no longer necessary.

26. *Consistency of Usage of Any Valid Method for SAR Computation.* As proposed in the 2013 RF Further Notice and supported in the record, the Commission modified the language in §§ 1.1307(b)(2)(iv) and 95.1221 of the rules by removing references to the finite difference time domain (FDTD) method for SAR computation and allowed any valid computational method supported by adequate documentation and consistent results to be used. In response to commenters' suggestion for increased reliance on field measurements for fixed sites rather than computation because of concerns that SAR computation would underestimate exposure, the Commission noted that computational methods for transmitter facilities tend to be more restrictive than measurements since they use maximum power and other conservative assumptions. Since such methods provide a simpler, less burdensome means of demonstrating compliance, the Commission decided that computational methods will be permitted where they can be successfully invoked. In response to a commenter's suggestion that software developers be given guidance about the requirements for valid computational software, the Commission directed the Commission's OET to provide guidance on acceptable methods of computation via the KDB.

27. *Removal from Rules of Minimum Evaluation Distance Requirement for Frequencies Above 6 GHz.* To better simulate RF exposure in typical situations, the Commission also eliminated from § 2.1093(d) of its rules a minimum measurement distance of 5 cm for measurements and calculations used to demonstrate RF exposure compliance for devices operating above 6 GHz. The Commission emphasized that applicants must provide specific justification for measurement distances used in compliance testing, describing the normal and feasible use(s) of the device. Equipment certification review will specifically include evaluation

of the propriety of this specification, including any measures that may be taken to ensure that it is maintained.

28. *Technical Evaluation References in Rules.* As proposed in the 2013 RF *Further Notice*, the Commission removed the reference to IEEE Standard C95.3-1991 from § 24.51(c) of its rules as a possible SAR evaluation reference, instead relying on publications in the KDB for providing guidance on technical evaluation procedures and standards. The Commission also determined that the FCC Laboratory's current process of issuing draft versions of KDB guidance documents, engaging manufacturers and other affected entities early in the revision process, and providing flexibility and harmony with existing standards effectively address the commenters' concerns about the process and transparency of developing KDB documents. Regarding OET Bulletins 56 and 65, the Commission decided to eliminate Bulletin 56 in deference to more current material on the same subject on the Commission's website, and that Commission staff will maintain and update OET Bulletin 65 as a standalone document available for download.

C. Mitigation Measures to Ensure Compliance with Exposure Limits

29. *Transient Exposure.* In the 2019 *Second Report and Order*, the Commission adopted its proposal to define transient exposure as the brief RF exposure in a controlled environment that does not exceed the general population limit, which may be averaged over a time interval up to 30 minutes (shorter averaging times are generally more conservative and may be used for convenience during evaluation). The rules the Commission adopted require, for controlled areas where the general population limit is exceeded, access controls and appropriate signage in addition to supervision of transient individuals by trained occupational

specialists. The Commission found no basis for permitting exposure of any untrained individuals – regardless of whether they are workers – greater than the general population exposure limit. The applicability of occupational limits requires that a person be fully aware (*e.g.*, training has been provided, warning signs detailing the nature of the hazard have been posted) and able to exercise control over his or her work-related exposure.

30. Thus, the occupational exposure limits apply only if a person has been trained and has sufficient information to be fully aware of nearby RF sources and the necessity and means of avoiding overexposure. To satisfy the requirement to present written or verbal information to untrained transient individuals within controlled environments, the Commission affirmed that written information may include signs, maps, or diagrams showing where exposure limits are exceeded, and verbal information may include prerecorded messages.

31. The Commission declined to adopt its proposal that transient exposure should not exceed the continuous occupational limit, listed in § 1.1310, at any time, since it agreed with a commenter that such a limit would result in a more restrictive exposure limit for transient individuals than for the general public, for which there is no temporal peak limit. The Commission also agreed with commenters that its current rules limiting exposure for all populations do not specify a cap at any peak value above the continuous limits. As long as the average over any applicable time-averaged period provided in the rules is compliant with the continuous general population limit, a transient individual walking in a controlled area may be exposed above the general population limit in one location and below this limit in another location – how much above that limit an instantaneous exposure is permitted is not defined in the rules.

32. Despite a commenter's concern about the use of the term "general population" in conjunction with "controlled," the Commission was not convinced by the concern over how the terminology should be applied, or that it was potentially introducing a third exposure category. The Commission noted that there are only two sets of limits – those which apply to supervised/trained workers (in an occupational setting) and those which apply to the general population (which includes unsupervised and untrained workers). The environment in which these exposures occur defines whether the exposure is in a controlled or uncontrolled setting. Because the Commission also adopted requirements for implementing RF safety programs at fixed sites, the only situation where transient exposure would be relevant would be in a controlled setting.

33. Despite commenters' arguments that the Commission's requirements for transient individuals to be supervised regarding RF exposure areas are unnecessary and burdensome and ultimately would not be practical or effective, the Commission maintained that the supervision requirement is reasonable since a new employee would be made aware of areas where exposure could exceed the limits as part of his/her supervised orientation. The Commission agreed with commenters that third-party workers who perform tasks near RF sources should be trained and not considered transient. It also agreed that transient provisions are not to be used with any regularity and would not apply to persons (*e.g.*, tree trimmers, window washers, *etc.*) expected to be in locations for extended periods where the general population RF limits are exceeded, nor to persons who traverse such areas on a regular basis. All such persons must receive appropriate training.

34. *Signage and Access Control.* To the extent that required signs are used to warn workers so they are protected from RF exposure levels that exceeds the Commission's limits, the Commission decided that the following information must be included in such signs:

- RF energy advisory symbol (*e.g.*, Figure A.3 of IEEE Standard C95.2-1999)
- A description of the RF source (*e.g.*, transmitting antennas)
- Behavior necessary to comply with the exposure limits (*e.g.*, do not climb tower unless you know that antennas are not energized; stay behind barrier or off of markings)
- Up-to-date contact information (*e.g.*, monitored phone number or email address connected to someone with authority and capability to provide prompt response).

35. As proposed in the *2013 RF Further Notice* and supported in the record, the Commission adopted four categories for specifying RF safety program actions that reflect potential RF exposure scenarios, analogous to the categories in the Institute of Electrical and Electronics Engineers (IEEE) Standard C95.7-2014 – “IEEE Recommended Practice for Radio Frequency Safety Programs, 3 kHz to 300 GHz.”

36. Category One applies to locations where the operational characteristics of RF sources would not cause the exposure limit for the general population to be exceeded even with continuous or with source-based time-averaged exposure. Category One signs are optional and will show a green “INFORMATION” heading and may be used to offer information to the public that a transmitting RF source is nearby but that it is compliant with the

Commission's RF exposure limits regardless of duration or usage. Category One signs could include the following:

- An explanation of safety precautions to be observed when closer to the antenna than the information sign (where applicable)
- Reminder to obey all postings and boundaries (if higher categories are nearby)
- Up-to-date contact information (if higher categories are nearby)
- Place to get additional information (such as a website, if no higher categories are nearby)

37. Category Two signs and positive access controls are required where the continuous exposure limit would be exceeded for the general population, but not for occupational personnel. Category Two signs must have the signal word "NOTICE" in blue color. Under certain controlled conditions, such as on a rooftop with limited access (*e.g.*, a locked door with appropriate signage or antenna concealment), the Commission allowed that a sign be attached directly to the antenna. A label affixed to an antenna will be considered sufficient only if it is readable from the direction of approach and at least at the separation distance required for compliance with the general population exposure limit. Appropriate training is required for any occupational personnel with access to the controlled area where the general population exposure limit is exceeded, and transient individuals must be supervised by occupational personnel with appropriate training upon entering any of these areas. Use of time averaging would be required for transient individuals in the area where the continuous general population exposure limit is exceeded. Though not required, use of personal RF monitors in the

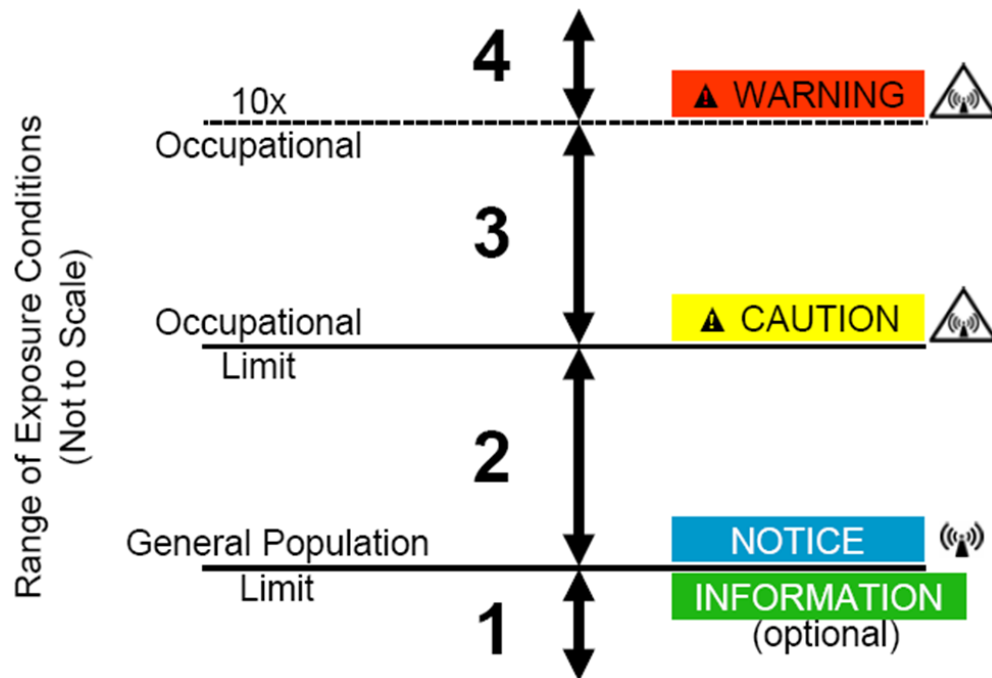
areas where the general population exposure limit is exceeded is an option likely to ensure compliance.

38. Category Three applies to locations where the exposure limit for occupational personnel would be exceeded potentially by up to a factor of ten. Category Three requires signs with the appropriate signal word “CAUTION” in yellow color, and control or indicators (*e.g.*, chains, railings, contrasting paint, diagrams), in addition to the positive access control established for Category Two, surrounding the area in which the exposure limit is exceeded. The Commission allowed, under certain controlled conditions, that a sign may be attached directly to the antenna. A label affixed to an antenna will be considered sufficient only if it is readable from the direction of approach and at least at the separation distance required for compliance with the occupational exposure limit. Additionally, appropriate training is required for any occupational personnel with access to the controlled area where the general population exposure limit is exceeded. Use of time averaging is required for transient individuals to ensure compliance with the general population exposure limit. Appropriately trained occupational personnel may use RF monitors or personal protective equipment to ensure compliance with the occupational limits. If such mitigation procedures or power reduction, and therefore Category reduction, are not feasible, then the lockout/tagout procedures specified in 29 CFR 1910.147 must be used.


39. Category Four applies to locations where the exposure limit for occupational personnel would be exceeded by more than a factor of ten, or where there is a possibility for serious contact injury, such as a severe burn, permanent tissue damage, or shock. Where the occupational limit could be exceeded by a more than factor of ten, “WARNING” signs in orange

color are required. “DANGER” signs in red color are required where immediate and serious injury will occur on contact, in addition to positive access control. For example, “DANGER” signs are required at the base of AM broadcast towers where serious injuries due to contact burns may occur. If a power reduction would not sufficiently protect against the relevant exposure limit in the event of human presence, lockout/tagout procedures must be followed to ensure human safety. To aid in protecting individuals from potentially serious and immediate harm, Category Four signs can be useful in indicating the most hazardous locations, even though Category Three signs already indicate an area surpassing the occupational exposure limit for continuous exposure. In Category Four locations, it is infeasible for any mitigation measures (*e.g.*, time-averaging, personal protective equipment) other than power reduction to bring exposure levels within the Commission’s occupational limits. See Figure 1 below for a visual description of these categories.

Figure 1. Graphical Representation of Exposure Categories and Associated Signage Requirements



NOTE: Where immediate and serious injury would occur on contact regardless of category, a

▲ DANGER  sign and associated components are required pursuant to the description of *Category Four*.

40. Determination of the appropriate category designation must not be based on the exemptions from routine RF evaluation, but instead must be based on a specific site evaluation, consistent with the Commission’s existing recommendations and rules for routine evaluation of compliance by measurement or computation as specified in OET Bulletin 65. Such methods as spatial averaging of plane-wave equivalent power-density, source-based time averaging, and SAR determinations may be used where appropriate to determine compliance with an applicable limit or classification of the environment into one of the categories. In contrast to IEEE’s reference to “action levels,” the general population exposure limit for uncontrolled environments is a definite legal limit enforced by the Commission.

41. Establishment of a controlled environment where this limit is exceeded (*i.e.*, a Category Two, Three, or Four environment) would generally require some type of positive access control. These include locked doors, ladder cages, or effective fences, as well as enforced prohibition of public access to external surfaces of buildings, or generally, active preclusion of unauthorized access. It does not include natural barriers that tend to limit access but may not be always effective or other access restrictions that do not require any action on the part of the licensee or property management. Members of the general public (which can include children and vision-impaired persons) should not be expected to be aware of or act on posted exposure conditions only. Barriers and/or markings are required to complement signs to ensure compliance with the Commission's RF exposure limits. In response to commenters' concerns about the risk of RF overexposure to unaware workers and that signs should not be a catchall compliance measure, the Commission observed that an appropriately trained worker will be able to interpret the signs to appropriately control his/her exposure, and emphasized that untrained workers should not have access to controlled locations without supervision.

42. The Commission required that signs have an up-to-date point of contact, but declined to require 24/7 monitoring. Instead, it directed the OET to update OET Bulletin 65 to specify that the contact point be continuously monitored during normal business hours, but did not specify a response time. In response to commenters' concerns regarding sign content and readability and the feasibility of implementing access controls, the Commission required that signs be legible and readily viewable and readable (as specified by the Occupational Safety and Health Administration and the former National Bureau of Standards) from the boundary (and as necessary, on the approach to this boundary) where the applicable RF exposure limits are

exceeded, and that controls or indicators be placed at compliance boundaries; it declined to adopt a site safety plan or a setback of 1500 feet from all cell towers as required components. The Commission also concluded that parties responsible for the placement of signs should consider the potential implications of over-signage (*e.g.*, undue alarm, confusion, and disregard of meaningful postings) and indicated that it will consider compliance with these rules on a case-by-case basis.

43. *Training to Ensure Compliance.* Because RF safety awareness is vitally important to ensure that persons are fully aware of the potential for RF exposure and can exercise control over their exposure, the Commission directed the OET to consider the topics outlined in Annex A of ANSI/IEEE C95.7-2005 – “IEEE Recommended Practice for Radio Frequency Safety Programs, 3 kHz to 300 GHz” as training guidance to reference in a future revision of OET Bulletin 65. The Commission emphasized that it does not consider signage at an access door to be sufficient to achieve the goal of training compliance for those persons potentially exposed beyond that door. The area beyond the door must also be appropriately signed, marked, and/or cordoned with barriers. Lockout/tagout could satisfy a need for power reduction, but are not appropriate as universal requirements. In the case of training using verbal information, the Commission clarified that either spoken word or pre-recorded audio from an authorized individual qualified to provide instruction on how to remain compliant is acceptable. Training may also include web-based programs.

44. *Responsibility for Mitigation Measures.* Despite comments requesting limitations on a licensee’s responsibility for RF exposure mitigation measures, the Commission declined to adopt safe harbors (*e.g.*, category-appropriate signage, access controls, indicative or

physical barriers, RF safety training, information about RF exposure risks in accessible areas, and 24/7 contact information) from actions and events at a restricted area beyond the licensee's control.

45. In response to comments on the responsibility of new entrants at multiple transmitter sites, the Commission clarified that while each nearby licensee shares responsibility for compliance, where it is demonstrated that a new or modified facility has put a previously-compliant site out of compliance, the licensee of that new/modified facility is solely responsible both for any compliance and for any enforcement action that may occur. At the same time, while the requirement for new and renewal applicants to evaluate and ensure compliance at sites is intended as a mechanism to maintain ongoing compliance, it does not absolve other license holders of responsibility or place sole responsibility for mitigation on the newcomer to a site who may discover noncompliance by existing site occupants or may contribute further to pre-existing noncompliance. The Commission found that such a general policy would not only discourage cooperation and site agreements, but also inappropriately absolve the preexisting licensees of their violations. The Commission expects that consideration of available evidence on a case-by-case basis during any appropriate enforcement actions can avoid inappropriate assignment of liability where noncompliance is found.

46. The Commission rejected a commenter's argument that, in addition to the Commission's requirements concerning warning signs and barriers, local authorities should be allowed to require additional signs and access restriction where they deem appropriate. While section 332(c)(7)(B)(iv) of the Act permits State and local governments, when making decisions on the "placement, construction, and modification" of personal wireless service facilities, to

consider whether such facilities comply with the Commission's regulations concerning RF emissions, it expressly prohibits them from imposing their own regulations on such facilities on the basis of the environmental effects of such emissions.

D. Transition Periods

47. To allow licensees and manufacturers time to complete the required RF exposure evaluations or determine whether they are exempt from evaluation, as well as allow an orderly transition for the Commission's licensing Bureaus and equipment authorization program to incorporate the new exemption criteria into their equipment certification policies and procedures, the Commission set a timetable for conducting the reevaluation, under the new rules, of antenna locations that were previously exempt from evaluation. As a commenter requested, the Commission allowed two years from the effective date of the new rules to complete the evaluations and comply with the more specific RF exposure mitigation requirements adopted in the 2019 *Second Report and Order*, as necessary.

E. Conforming Edits

48. In the 2013 *RF Further Notice*, the Commission proposed to reword §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 in its rules as necessary to ensure clarity and consistency. In addition, it proposed to make changes to specific sections of parts 15, 24, 25, 95, and 97 for consistency and as necessary depending on the substantive changes in parts 1 and 2. Since the Commission proposed that its general RF exposure evaluation exemption criteria apply to all rule parts authorizing RF sources, specific exceptions in rule parts other than parts 1 and 2 were not necessary. No specific comments were received on these proposals and the Commission took the following actions:

- For applicants for equipment authorizations covered by parts 15 and 18, in §§ 15.212(a)(viii), 15.247(i), 15.255(g), 15.257(g), 15.319(i), 15.407(f), 15.709(h), and 18.313, we substitute our general exemption criteria for the specific exemption from routine evaluation;
- For applicants and licensees in the Public Mobile Service Personal Communications Service, we add and substitute our general exemption criteria for the specific exemption from routine evaluation in §§ 22.379 and 24.52;
- For applicants and licensees of satellite earth stations, we remove the 5 percent criterion in § 25.117(g) and introduce similar language to § 25.115, paragraph (p), § 25.129, paragraph (c), § 25.149, paragraph (c)(3), and § 25.271, paragraph (g);
- For applicants and licensees in the Miscellaneous Wireless Communications Services, Radio Broadcast Services, and Private Land Mobile Services we substitute our general exemption criteria for the specific exemption from routine evaluation by modifying §§ 27.52, 73.404, paragraph (e)(10), and by adding § 90.223 and removing § 90.223;
- We add mobile devices to § 95.2385 for WMTS and edit § 95.2585 to eliminate the limited specification of FDTD modeling for MedRadio service medical implants;
- For applicants and licensees in the Amateur Radio Service, we substitute our general exemption criteria for the specific exemption from routine evaluation

based on power alone in § 97.13(c)(1) and specify the use of occupational/controlled limits for amateurs where appropriate; and

- For applicants and licensees in the Multichannel Video Distribution and Data Service, we substitute our general exemption criteria for the specific exemption from routine evaluation of stations in the 12.2-12.7 GHz frequency band with output powers less than 1640 watts EIRP, in § 101.1425.

Each of these changes will improve consistency and clarity of the rules.

Memorandum Opinion and Order

49. In the 2019 *Memorandum Opinion and Order*, the Commission dismissed and alternatively denied a petition for reconsideration of its decision in the 2013 *First RF Report and Order* to classify the pinna (outer ear) as an extremity in RF exposure testing. The Commission found that the petition contained no new information that specifically addressed the effects of RF exposure on the pinnae themselves and otherwise relied on arguments that have been fully considered and rejected. Furthermore, the Commission found that the petition did not raise any new arguments when it cited alternative concerns related to pinnae classification, brain proximity, and human safety; offered no persuasive evidence that the Commission's analysis was flawed; and that it did not demonstrate any errors or omissions in the Commission's previous decision. For these reasons, the Commission dismissed and alternatively denied the petition for reconsideration.

Termination of Notice of Inquiry (ET DOCKET NO. 13-84)

50. In the 2019 *Termination of Notice of Inquiry*, the Commission terminated the *Notice of Inquiry* proceeding in ET Docket No. 13-84 that it initiated in 2013 to review its existing RF exposure standards and certain related policies without making any changes to the Commission's RF rules. While some commenters suggested that the Commission should revise its RF exposure standards to be consistent with other international standards, the Commission declined to make any changes that would effectively relax its current standards, concluding that the best available evidence, including consideration of the opinions provided by expert U.S. federal health agencies, supports maintaining the Commission's existing RF exposure standards.. The Commission also determined that commenters suggesting alternatives that would tighten the FCC's existing RF exposure standards did not offer a sufficient scientific basis as to how their proposed reductions were derived, why the proposed reductions specified the appropriate amount, or how their proposed alternative reductions may impact the viability or performance of wireless services and devices.

III. PROCEDURAL MATTERS

A. Paperwork Reduction Act Analysis

51. This document contains new information collections subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104–13.

B. Congressional Review Act

52. The Commission will send a copy of the *Second Report and Order*, *Memorandum Opinion and Order*, and *Termination of Notice of Inquiry* in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act, see 5 U.S.C. 801(a)(1)(A).

C. Final Regulatory Flexibility Act

53. The Regulatory Flexibility Act of 1980 (RFA) requires that an agency prepare a regulatory flexibility analysis for notice and comment rulemakings, unless the agency certifies that “the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities.” Accordingly, the Commission has prepared a Final Regulatory Flexibility

54. Analysis (FRFA), set forth in Appendix D of the 2019 *Second Report and Order, Memorandum Opinion and Order, and Termination of Notice of Inquiry* concerning the possible impact of the rule changes.

IV. ORDERING CLAUSES

55. Accordingly, *it is ordered* that pursuant to sections 1, 4(i), 4(j), 301, 302, 303(r), 307, 308, 309, 332(a)(1), 332(c)(7)(B)(iv), and 403 of the Communications Act of 1934, as amended, 47 U.S.C. 151, 154(i), 154(j), 301, 302a, 303(r), 307, 308, 309, 332(a)(1), 332(c)(7)(B)(iv), 403; the National Environmental Policy Act of 1969, 42 U.S.C. 4321, *et seq.*; and section 704(b) of the Telecommunications Act of 1996, Pub. L. No. 104-104, the *Second Report and Order* in ET Docket No. 03-137 is hereby adopted.

56. *It is further ordered* that parts 1, 2, 15, 18, 22, 24, 25, 27, 73, 90, 95, 97, and 101 of the Commission’s rules, 47 CFR parts 1, 2, 15, 18, 22, 24, 25, 27, 73, 90, 95, 97 and 101, *are amended*, effective **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**, except for §§ 2.1091 and 2.1093 of the Commission’s rules, which contain new or modified information collection requirements that require approval by the Office of Management and Budget under the Paperwork Reduction Act and *will become effective* after

the Commission publishes a notice in the **Federal Register** announcing such approval and the relevant effective date.

57. *It is further ordered* that pursuant to section 405 of the Communications Act of 1934, as amended, 47 U.S.C. 405, and § 1.429 of the Commission's rules, 47 CFR 1.429, this *Memorandum Opinion and Order* is hereby adopted and the Petition for Reconsideration filed by the American Association for Justice is dismissed and alternatively denied.

58. *It is further ordered* that pursuant to authority contained in sections 4(i) and 4(j) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 154(j), and § 1.430 of the Commission's rules, 47 CFR 1.430, the *Notice of Inquiry* in ET Docket No. 13-84 is terminated.

59. *It is further ordered* that pursuant to the authority contained in sections 4(i) and 4(j) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 154(j), and § 1.430 of the Commission's rules, 47 CFR 1.430, ET Docket No. 03-137 in terminated.

60. *It is further ordered* that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, shall send a copy of the *Second Report and Order*, including the Final Regulatory Flexibility Analysis, and the *Memorandum Opinion and Order*, to the Chief Counsel for Advocacy of the Small Business Administration.

List of Subjects

47 CFR Part 1

Communications, Telecommunications

47 CFR Part 2

Communications equipment, Radio, Telecommunications, Television

47 CFR Part 15

Communications equipment, Labeling, Radio

47 CFR Part 18

Household appliances, Medical devices, Radio, Scientific equipment, Radio

47 CFR Part 22

Communications, Communications equipment, Radio, Telecommunications

47 CFR Part 24

Communications equipment, Radio, Telecommunications

47 CFR Part 27 and 73

Communications equipment, Radio, Television

47 CFR Part 90, 95, 97, and 101

Communications equipment, Radio

Federal Communications Commission.

Marlene Dortch,

Secretary.

Final Rules

For the reasons discussed in the preamble, the Federal Communication Commission amends 47 CFR parts 1, 2, 15, 24, 25, 27, 73, 90, 95, 97, and 101 as follows:

PART 1 – PRACTICE AND PROCEDURE

1. The authority citation for part 1 continues to read as follows:

Authority: 47 U.S.C. chs. 2, 5, 9, 13; 28 U.S.C. 2461 note, unless otherwise noted.

2. Section 1.1307 is amended by revising paragraph (b) to read as follows:

§ 1.1307 Actions that may have a significant environmental effect, for which Environmental Assessments (EA) must be prepared.

* * * * *

(b)(1) *Requirements.* (i) With respect to the limits on human exposure to RF provided in § 1.1310 of this chapter, applicants to the Commission for the grant or modification of construction permits, licenses or renewals thereof, temporary authorities, equipment authorizations, or any other authorizations for radiofrequency sources must either:

(A) Determine that they qualify for an exemption pursuant to § 1.1307(b)(3);

(B) Prepare an evaluation of the human exposure to RF radiation pursuant to § 1.1310 and include in the application a statement confirming compliance with the limits in § 1.1310; or

(C) Prepare an Environmental Assessment if those RF sources would cause human exposure to levels of RF radiation in excess of the limits in § 1.1310.

(ii) Compliance with these limits for fixed RF source(s) may be accomplished by use of mitigation actions, as provided in § 1.1307(b)(4). Upon request by the Commission, the party seeking or holding such authorization must submit technical information showing the basis for such compliance, either by exemption or evaluation. Notwithstanding the preceding requirements, in the event that RF sources cause human exposure to levels of RF radiation in excess of the limits in § 1.1310 of this chapter, such RF exposure exemptions and evaluations are not deemed sufficient to show that there is no significant effect on the quality of the human environment or that the RF sources are categorically excluded from environmental processing.

(2) *Definitions.* For the purposes of this section, the following definitions shall apply.

Available maximum time-averaged power for an RF source is the maximum available RF power (into a matched load) as averaged over a *time-averaging period*;

Category One is any spatial region that is compliant with the general population exposure limit with *continuous exposure* or *source-based time-averaged exposure*;

Category Two is any spatial region where the general population exposure limit is exceeded but that is compliant with the occupational exposure limit with *continuous exposure*;

Category Three is any spatial region where the occupational exposure limit is exceeded but by no more than ten times the limit;

Category Four is any spatial region where the exposure is more than ten times the occupational exposure limit or where there is a possibility for serious injury on contact.

Continuous exposure refers to the maximum time-averaged exposure at a given location for an *RF source* and assumes that exposure may take place indefinitely. The exposure limits in § 1.1310 of this chapter are used to establish the spatial regions where mitigation measures are necessary assuming continuous exposure as prescribed in § 1.1307(b)(4) of this chapter.

Effective Radiated Power (ERP) is the product of the *maximum antenna gain* which is the largest far-field power gain relative to a dipole in any direction for each transverse polarization component, and the *maximum delivered time-averaged power* which is the largest net power delivered or supplied to an antenna as averaged over a *time-averaging period*; *ERP* is summed over two polarizations when present;

Exemption for (an) *RF source(s)* is solely from the obligation to perform a routine environmental evaluation to demonstrate compliance with the RF exposure limits in § 1.1310 of this chapter; it is not exemption from the equipment authorization procedures described in part 2 of this chapter, not exemption from general obligations of compliance with the RF exposure limits in § 1.1310 of this chapter, and not exemption from determination of whether there is no significant effect on the quality of the human environment under § 1.1306 of this chapter.

Fixed RF source is one that is physically secured at one location, even temporarily, and is not able to be easily moved to another location while radiating;

Mobile device is as defined in § 2.1091(b) of this chapter;

Plane-wave equivalent power density is the square of the root-mean-square (rms) electric field strength divided by the impedance of free space (377 ohms).

Portable device is as defined in § 2.1093(b) of this chapter;

Positive access control is mitigation by proactive preclusion of unauthorized access to the region surrounding an RF source where the continuous exposure limit for the general population is exceeded. Examples of such controls include locked doors, ladder cages, or effective fences, as well as enforced prohibition of public access to external surfaces of buildings. However, it does not include natural barriers or other access restrictions that did not require any action on the part of the licensee or property management.

Radiating structure is an unshielded RF current-carrying conductor that generates an RF reactive near electric or magnetic field and/or radiates an RF electromagnetic wave. It is the component of an *RF source* that transmits, generates, or reradiates an RF fields, such as an antenna, aperture, coil, or plate.

RF source is Commission-regulated equipment that transmits or generates RF fields or waves, whether intentionally or unintentionally, via one or more *radiating structure(s)*. Multiple *RF sources* may exist in a single *device*.

Separation distance (variable R in Table 1) is the minimum distance in any direction from any part of a *radiating structure* and any part of the body of a nearby person;

Source-based time averaging is an average of instantaneous exposure over a *time-averaging period* that is based on an inherent property or duty-cycle of a device to ensure compliance with the *continuous exposure* limits;

Time-averaging period is a time period not to exceed 30 minutes for fixed RF sources or a time period inherent from device transmission characteristics not to exceed 30 minutes for mobile and portable RF sources;

Transient individual is an untrained person in a location where occupational/controlled limits apply, and he or she must be made aware of the potential for exposure and be supervised by trained personnel pursuant to § 1.1307(b)(4) of this chapter where use of time averaging is required to ensure compliance with the general population exposure limits in § 1.1310 of this chapter.

(3) *Determination of exemption.* (i) For single RF sources (*i.e.*, any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}}(d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C)—Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency (MHz)	Threshold ERP (watts)
0.3 – 1.34	$1,920 R^2$
1.34 – 30	$3,450 R^2/f^2$
30 – 300	$3.83 R^2$
300 – 1,500	$0.0128 R^2 f$

1,500 – 100,000	19.2R ²
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(ii) For multiple RF sources: Multiple RF sources are exempt if:

(A) the available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).

(B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Where

- a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for P_{th} , including existing exempt transmitters and those being added.
- b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.
- c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.
- P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).
- $P_{th,i}$ = the exemption threshold power (P_{th}) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i .
- ERP_j = the ERP of fixed, mobile, or portable RF source j .
- $ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source j , at a distance of at least $\lambda/2\pi$ according to the applicable formula of paragraph (b)(3)(i)(C) of this section.
- $Evaluated_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit_k = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source *k*, as applicable from § 1.1310 of this chapter.

(4) *Mitigation.* (i) As provided in paragraphs (b)(4)(ii) through (vi) of this section, specific mitigation actions are required for fixed RF sources to the extent necessary to ensure compliance with our exposure limits, including the implementation of an RF safety plan, restriction of access to those RF sources, and disclosure of spatial regions where exposure limits are exceeded.

(ii) Category One – INFORMATION: No mitigation actions are required when the RF source does not cause continuous or source-based time-averaged exposure in excess of the general population limit in s§ 1.1310 of this part. Optionally a green “INFORMATION” sign may offer information to those persons who might be approaching RF sources. This optional sign, when used, must include at least the following information: appropriate signal word “INFORMATION” and associated color (green), an explanation of the safety precautions to be observed when closer to the antenna than the information sign, a reminder to obey all postings and boundaries (if higher categories are nearby), up-to-date licensee (or operator) contact information (if higher categories are nearby), and a place to get additional information (such as a website, if no higher categories are nearby).

(iii) Category Two – NOTICE: Mitigation actions are required in the form of signs and positive access control surrounding the boundary where the continuous exposure limit is

exceeded for the general population, with the appropriate signal word “NOTICE” and associated color (blue) on the signs. Signs must contain the components discussed in paragraph (b)(4)(vi) of this section. Under certain controlled conditions, such as on a rooftop with limited access, a sign attached directly to the surface of an antenna will be considered sufficient if the sign specifies a minimum approach distance and is readable at this separation distance and at locations required for compliance with the general population exposure limit in § 1.1310 of this part. Appropriate training is required for any occupational personnel with access to controlled areas within restrictive barriers where the general population exposure limit is exceeded, and transient individuals must be supervised by trained occupational personnel upon entering any of these areas. Use of time averaging is required for transient individuals to ensure compliance with the general population exposure limit.

(iv) Category Three – CAUTION: Signs (with the appropriate signal word “CAUTION” and associated color (yellow) on the signs), controls, or indicators (*e.g.*, chains, railings, contrasting paint, diagrams) are required (in addition to the positive access control established for Category Two) surrounding the area in which the exposure limit for occupational personnel in a controlled environment is exceeded by no more than a factor of ten. Signs must contain the components discussed in paragraph (b)(4)(vi) of this section. If the boundaries between Category Two and Three are such that placement of both Category Two and Three signs would be in the same location, then the Category Two sign is optional. Under certain controlled conditions, such as on a rooftop with limited access, a sign may be attached directly to the surface of an antenna within a controlled environment if it specifies the minimum approach distance and is readable at this distance and at locations required for compliance with the

occupational exposure limit in § 1.1310 of this part. If signs are not used at the occupational exposure limit boundary, controls or indicators (*e.g.*, chains, railings, contrasting paint, diagrams, *etc.*) must designate the boundary where the occupational exposure limit is exceeded. Additionally, appropriate training is required for any occupational personnel with access to the controlled area where the general population exposure limit is exceeded, and transient individuals must be supervised by trained personnel upon entering any of these areas. Use of time averaging is required for transient individuals to ensure compliance with the general population exposure limit. Further mitigation by reducing exposure time in accord with six-minute time averaging is required for occupational personnel in the area in which the occupational exposure limit is exceeded. However, proper use of RF personal protective equipment may be considered sufficient in lieu of time averaging for occupational personnel in the areas in which the occupational exposure limit is exceeded. If such procedures or power reduction, and therefore Category reduction, are not feasible, then lockout/tagout procedures in 29 CFR 1910.147 must be followed.

(v) Category Four – WARNING/DANGER: Where the occupational limit could be exceeded by a factor of more than ten, “WARNING” signs with the associated color (orange), controls, or indicators (*e.g.*, chains, railings, contrasting paint, diagrams) are required (in addition to the positive access control established for Category Two) surrounding the area in which the occupational exposure limit in a controlled environment is exceeded by more than a factor of ten. Signs must contain the components discussed in paragraph (b)(4)(vi) of this section. “DANGER” signs with the associated color (red) are required where immediate and serious injury will occur on contact, in addition to positive access control, regardless of

mitigation actions taken in Categories Two or Three. If the boundaries between Category Three and Four are such that placement of both Category Three and Four signs would be in the same location, then the Category Three sign is optional. No access is permitted without Category reduction. If power reduction, and therefore Category reduction, is not feasible, then lockout/tagout procedures in 29 CFR 1910.147 must be followed.

(vi) RF exposure advisory signs must be viewable and readable from the boundary where the applicable exposure limits are exceeded, pursuant to 29 CFR 1910.145, and include at least the following five components:

(A) Appropriate signal word, associated color {*i.e.*, “DANGER” (red), “WARNING” (orange), “CAUTION,” (yellow) “NOTICE” (blue)};

(B) RF energy advisory symbol;

(C) An explanation of the RF source;

(D) Behavior necessary to comply with the exposure limits; and

(E) Up-to-date contact information.

(5) *Responsibility for compliance.* (i) In general, when the exposure limits specified in § 1.1310 of this part are exceeded in an accessible area due to the emissions from multiple fixed RF sources, actions necessary to bring the area into compliance or preparation of an Environmental Assessment (EA) as specified in § 1.1311 of this part are the shared responsibility of all licensees whose RF sources produce, at the area in question, levels that exceed 5% of the applicable exposure limit proportional to power. However, a licensee

demonstrating that its facility was not the most recently modified or newly-constructed facility at the site establishes a rebuttable presumption that such licensee should not be liable in an enforcement proceeding relating to the period of non-compliance. Field strengths must be squared to be proportional to SAR or power density. Specifically, these compliance requirements apply if the square of the electric or magnetic field strength exposure level applicable to a particular RF source exceeds 5% of the square of the electric or magnetic field strength limit at the area in question where the levels due to multiple fixed RF sources exceed the exposure limit. Site owners and managers are expected to allow applicants and licensees to take reasonable steps to comply with the requirements contained in paragraph (b)(1) of this section and, where feasible, should encourage co-location of RF sources and common solutions for controlling access to areas where the RF exposure limits contained in § 1.1310 of this part might be exceeded. Applicants and licensees are required to share technical information necessary to ensure joint compliance with the exposure limits, including informing other licensees at a site in question of evaluations indicating possible non-compliance with the exposure limits.

(ii) Applicants for proposed RF sources that would cause non-compliance with the limits specified in § 1.1310 at an accessible area previously in compliance must submit an EA if emissions from the applicant's RF source would produce, at the area in question, levels that exceed 5% of the applicable exposure limit. Field strengths must be squared if necessary to be proportional to SAR or power density.

(iii) Renewal applicants whose RF sources would cause non-compliance with the limits specified in § 1.1310 at an accessible area previously in compliance must submit an EA if emissions from the applicant's RF source would produce, at the area in question, levels that exceed 5% of the applicable exposure limit. Field strengths must be squared if necessary to be proportional to SAR or power density.

* * * * *

3. Section 1.1310 is revised to read as follows:

§ 1.1310 Radiofrequency radiation exposure limits.

(a) Specific absorption rate (SAR) shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in § 1.1307(b) of this part within the frequency range of 100 kHz to 6 GHz (inclusive).

(b) The SAR limits for occupational/controlled exposure are 0.4 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 8 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit for occupational/controlled exposure is 20 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 6 minutes to determine compliance with occupational/controlled SAR limits.

(c) The SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit is 4 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.

(d)(1) Evaluation with respect to the SAR limits in this section must demonstrate compliance with both the whole-body and peak spatial-average limits using technically supported measurement or computational methods and exposure conditions in advance of authorization (licensing or equipment certification) and in a manner that facilitates independent assessment and, if appropriate, enforcement. Numerical computation of SAR must be supported by adequate documentation showing that the numerical method as implemented in the computational software has been fully validated; in addition, the equipment under test and exposure conditions must be modeled according to protocols established by FCC-accepted numerical computation standards or available FCC procedures for the specific computational method.

(2) For operations within the frequency range of 300 kHz and 6 GHz (inclusive), the limits for maximum permissible exposure (MPE), derived from whole-body SAR limits and listed in Table 1 in paragraph (e)(1) of this section, may be used instead of whole-body SAR limits as set forth in paragraphs (a) through (c) of this section to evaluate the environmental impact of

human exposure to RF radiation as specified in § 1.1307(b) of this part, except for portable devices as defined in § 2.1093 of this chapter as these evaluations shall be performed according to the SAR provisions in § 2.1093.

(3) At operating frequencies above 6 GHz, the MPE limits listed in Table 1 in paragraph (e)(1) of this section shall be used in all cases to evaluate the environmental impact of human exposure to RF radiation as specified in § 1.1307(b) of this part.

(4) Both the MPE limits listed in Table 1 in paragraph (e)(1) of this section and the SAR limits as set forth in paragraphs (a) through (c) of this section are for continuous exposure, that is, for indefinite time periods. Exposure levels higher than the limits are permitted for shorter exposure times, as long as the average exposure over a period not more than the specified averaging time in Table 1 in paragraph (e)(1) is less than (or equal to) the exposure limits. Detailed information on our policies regarding procedures for evaluating compliance with all of these exposure limits can be found in the most recent edition of FCC's *OET Bulletin 65*, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields," and its supplements, all available at the FCC's Internet Web site: <https://www.fcc.gov/general/oet-bulletins-line>, and in the Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB) (<https://www.fcc.gov/kdb>).

Note to paragraphs (a) through (d): SAR is a measure of the rate of energy absorption due to exposure to RF electromagnetic energy. These SAR limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized SAR in Section 4.2 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio

Frequency Electromagnetic Fields, 3 kHz to 300 GHz,” ANSI/IEEE Std C95.1-1992, copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in “Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,” NCRP Report No. 86, Section 17.4.5, copyright 1986 by NCRP, Bethesda, Maryland 20814. Limits for whole body SAR and peak spatial-average SAR are based on recommendations made in both of these documents. The MPE limits in Table 1 are based generally on criteria published by the NCRP in “Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,” NCRP Report No. 86, Sections 17.4.1, 17.4.1.1, 17.4.2 and 17.4.3, copyright 1986 by NCRP, Bethesda, Maryland 20814. In the frequency range from 100 MHz to 1500 MHz, these MPE exposure limits for field strength and power density are also generally based on criteria recommended by the ANSI in Section 4.1 of “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,” ANSI/IEEE Std C95.1-1992, copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017.

(e)(1) Table 1 to § 1.1310(e)(1) sets forth limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

Table 1 to § 1.1310(e)(1)—Limits for Maximum Permissible Exposure (MPE)

Frequency range	Electric field strength	Magnetic field strength	Power density	Averaging time
(MHz)	(V/m)	(A/m)	(mW/cm²)	(minutes)

(i) Limits for Occupational/Controlled Exposure				
0.3–3.0	614	1.63	*(100)	≤ 6
3.0–30	1842/f	4.89/f	*(900/f ²)	< 6
30–300	61.4	0.163	1.0	< 6
300–1500			f/300	< 6
1500–100,000			5	< 6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	< 30
1.34–30	824/f	2.19/f	*(180/f ²)	< 30
30–300	27.5	0.073	0.2	< 30
300–1500			f/1500	< 30
1500–100,000			1.0	< 30

f = frequency in MHz

* = Plane-wave equivalent power density

(2) Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the

potential for exposure and can exercise control over their exposure. The phrase *fully aware* in the context of applying these exposure limits means that an exposed person has received written and/or verbal information fully explaining the potential for RF exposure resulting from his or her employment. With the exception of *transient* persons, this phrase also means that an exposed person has received appropriate training regarding work practices relating to controlling or mitigating his or her exposure. In situations when an untrained person is transient through a location where occupational/controlled limits apply, he or she must be made aware of the potential for exposure and be supervised by trained personnel pursuant to § 1.1307(b)(2) of this part where use of time averaging is required to ensure compliance with the general population exposure limit. The phrase *exercise control* means that an exposed person is allowed and also knows how to reduce or avoid exposure by administrative or engineering work practices, such as use of personal protective equipment or time averaging of exposure.

(3) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. For example, RF sources intended for consumer use shall be subject to the limits for general population/uncontrolled exposure in this section.

§ 1.4000 [Amended]

4. Section 1.4000 is amended by removing and reserving paragraph (c).

PART 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

5. The authority citation for part 2 continues to read as follows:

Authority: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

6. Section 2.1033 is amended by adding paragraph (f) to read as follows:

§ 2.1033 Application for certification.

* * * * *

(f) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of RF sources under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

7. Section 2.1091 is amended by revising paragraphs (b) and (c), removing paragraph (d) introductory text, and revising paragraphs (d)(1) and (2) to read as follows:

§ 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.

* * * * *

(b) For purposes of this section, the definitions in § 1.1307(b)(2) of this chapter shall apply. A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the RF source's radiating structure(s) and the body

of the user or nearby persons. In this context, the term “fixed location” means that the device is physically secured at one location and is not able to be easily moved to another location while transmitting. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal desktop computer, are considered to be mobile devices if they meet the 20-centimeter separation requirement.

(c)(1) Evaluation of compliance with the exposure limits in § 1.1310 of this chapter, and preparation of an EA if the limits are exceeded, is necessary for mobile devices with single RF sources having either more than an available maximum time-averaged power of 1 mW or more than the ERP listed in Table 1 to § 1.1307(b)(3)(i)(C), whichever is greater. For mobile devices not exempt by § 1.1307(b)(3)(i)(C) at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in § 1.1310 of this chapter is necessary if the ERP of the device is greater than ERP_{20cm} in the formula below. If the ERP of a single RF source at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz is not easily obtained, then the available maximum time-averaged power may be used (*i.e.*, without consideration of ERP) in comparison with the following formula only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

$$P_{th}(\text{mW}) = ERP_{20\text{ cm}}(\text{mW}) = \begin{cases} 2040f & 0.3\text{ GHz} \leq f < 1.5\text{ GHz} \\ 3060 & 1.5\text{ GHz} \leq f \leq 6\text{ GHz} \end{cases}$$

(2) For multiple mobile or portable RF sources within a device operating in the same time averaging period, routine environmental evaluation is required if the formula in § 1.1307(b)(3)(ii)(B) of this chapter is applied to determine the exemption ratio and the result is greater than 1.

(3) Unless otherwise specified in this chapter, any other single mobile or multiple mobile and portable RF source(s) associated with a device is exempt from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in § 1.1307(c) and (d) of this chapter.

(d)(1) Applications for equipment authorization of mobile RF sources subject to routine environmental evaluation must contain a statement confirming compliance with the limits specified in § 1.1310 of this chapter as part of their application. Technical information showing the basis for this statement must be submitted to the Commission upon request. In general, maximum time-averaged power levels must be used for evaluation. All unlicensed personal communications service (PCS) devices and unlicensed NII devices shall be subject to the limits for general population/uncontrolled exposure.

(2)(i) For purposes of analyzing mobile transmitting devices under the occupational/controlled criteria specified in § 1.1310 of this chapter, time averaging provisions of the limits may be used in conjunction with the maximum duty factor to determine maximum time-averaged exposure levels under normal operating conditions.

(ii) Such time averaging provisions based on maximum duty factor may not be used in determining exposure levels for devices intended for use by consumers in general population/uncontrolled environments as defined in § 1.1310 of this chapter. However, “source-based” time averaging based on an inherent property of the RF source is allowed over a time period not to exceed 30 minutes. An example of this is the determination of exposure from a device that uses digital technology such as a time-division multiple-access (TDMA) scheme for transmission of a signal.

* * * * *

8. Section 2.1093 is amended by revising paragraphs (b) through (d) to read as follows:

§ 2.1093 Radiofrequency radiation exposure evaluation: portable devices.

* * * * *

(b) For purposes of this section, the definitions in § 1.1307(b)(2) of this chapter shall apply. A portable device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that the RF source's radiating structure(s) is/are within 20 centimeters of the body of the user.

(c)(1) Evaluation of compliance with the exposure limits in § 1.1310 of this chapter, and preparation of an EA if the limits are exceeded, is necessary for portable devices having single RF sources with more than an available maximum time-averaged power of 1 mW, more than the ERP listed in Table 1 to § 1.1307(b)(3)(i)(C), or more than the P_{th} in the following formula,

whichever is greater. The following formula shall only be used in conjunction with portable devices not exempt by § 1.1307(b)(3)(i)(C) at distances from 0.5 centimeters to 20 centimeters and frequencies from 0.3 GHz to 6 GHz.

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the minimum separation distance (cm) in any direction from any part of the device antenna(s) or radiating structure(s) to the body of the device user.

(2) For multiple mobile or portable RF sources within a device operating in the same time averaging period, evaluation is required if the formula in § 1.1307(b)(3)(ii)(B) of this chapter is applied to determine the exemption ratio and the result is greater than 1.

(3) Unless otherwise specified in this chapter, any other single portable or multiple mobile and portable RF source(s) associated with a device is exempt from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in § 1.1307(c) and (d) of this chapter.

(d)(1) Applications for equipment authorization of portable RF sources subject to routine environmental evaluation must contain a statement confirming compliance with the limits specified in § 1.1310 of this chapter as part of their application. Technical information showing the basis for this statement must be submitted to the Commission upon request. The SAR limits specified in § 1.1310(a) through (c) of this chapter shall be used for evaluation of portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz shall be evaluated in terms of the MPE limits specified in Table 1 to § 1.1310(e)(1) of this chapter. A minimum separation distance applicable to the operating configurations and exposure conditions of the device shall be used for the evaluation. In general, maximum time-averaged power levels must be used for evaluation. All unlicensed personal communications service (PCS) devices and unlicensed NII devices shall be subject to the limits for general population/uncontrolled exposure.

(2) Evaluation of compliance with the SAR limits can be demonstrated by either laboratory measurement techniques or by computational modeling. The latter must be supported by adequate documentation showing that the numerical method as implemented in the computational software has been fully validated; in addition, the equipment under test and exposure conditions must be modeled according to protocols established by FCC-accepted

numerical computation standards or available FCC procedures for the specific computational method. Guidance regarding SAR measurement techniques can be found in the Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB). The staff guidance provided in the KDB does not necessarily represent the only acceptable methods for measuring RF exposure or RF emissions, and is not binding on the Commission or any interested party.

(3) For purposes of analyzing portable RF sources under the occupational/controlled SAR criteria specified in § 1.1310 of this chapter, time averaging provisions of the limits may be used in conjunction with the maximum duty factor to determine maximum time-averaged exposure levels under normal operating conditions.

(4) The time averaging provisions for occupational/controlled SAR criteria, based on maximum duty factor, may not be used in determining typical exposure levels for portable devices intended for use by consumers, such as cellular telephones, that are considered to operate in general population/uncontrolled environments as defined in § 1.1310 of this chapter. However, “source-based” time averaging based on an inherent property of the RF source is allowed over a time period not to exceed 30 minutes. An example of this would be the determination of exposure from a device that uses digital technology such as a time-division multiple-access (TDMA) scheme for transmission of a signal.

(5) Visual advisories (such as labeling, embossing, or on an equivalent electronic display) on portable devices designed only for occupational use can be used as part of an applicant’s evidence of the device user’s awareness of occupational/controlled exposure limits.

Such visual advisories shall be legible and clearly visible to the user from the exterior of the device. Visual advisories must indicate that the device is for occupational use only, refer the user to specific information on RF exposure, such as that provided in a user manual and note that the advisory and its information is required for FCC RF exposure compliance. Such instructional material must provide users with information on how to use the device and to ensure users are *fully aware* of and able to *exercise control* over their exposure to satisfy compliance with the occupational/controlled exposure limits. A sample of the visual advisory, illustrating its location on the device, and any instructional material intended to accompany the device when marketed, shall be filed with the Commission along with the application for equipment authorization. Details of any special training requirements pertinent to mitigating and limiting RF exposure should also be submitted. Holders of grants for portable devices to be used in occupational settings are encouraged, but not required, to coordinate with end-user organizations to ensure appropriate RF safety training.

(6) General population/uncontrolled exposure limits defined in § 1.1310 of this chapter apply to portable devices intended for use by consumers or persons who are exposed as a consequence of their employment and may not be fully aware of the potential for exposure or cannot exercise control over their exposure. No communication with the consumer including either visual advisories or manual instructions will be considered sufficient to allow consumer portable devices to be evaluated subject to limits for occupational/controlled exposure specified in § 1.1310 of this chapter.

PART 15 - RADIO FREQUENCY DEVICES

9. The authority citation for part 15 continues to read as follows:

Authority: 47 U.S.C. 154, 302a, 303, 304, 307, 336, 544a, 549.

10. Section 15.212 is amended by revising paragraph (a)(1)(viii) to read as follows:

§ 15.212 Modular transmitters.

(a) * * *

(1) * * *

(viii) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of modular transmitters under this section must contain a statement confirming compliance with these requirements. The modular transmitter must comply with any applicable RF exposure requirements in its final configuration. Technical information showing the basis for this statement must be submitted to the Commission upon request.

* * * * *

11. Section 15.247 is amended by designating the note following paragraph (h) as “note to paragraph (h)” and by revising paragraph (i).

The revision reads as follows:

§ 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

* * * * *

(i) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

12. Section 15.255 is amended by revising paragraph (g) to read as follows:

§ 15.255 Operation within the band 57-71 GHz.

* * * * *

(g) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

* * * * *

13. Section 15.257 is amended by revising paragraph (g) to read as follows:

§ 15.257 Operation within the band 92-95 GHz.

* * * * *

(g) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

* * * * *

14. Section 15.319 is amended by revising paragraph (i) to read as follows:

§ 15.319 General technical requirements.

* * * * *

(i) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a “general population/uncontrolled” environment. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

15. Section 15.407 is amended by revising paragraph (f) to read as follows:

§ 15.407 General technical requirements.

* * * * *

(f) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a “general population/uncontrolled” environment. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

* * * * *

16. Section 15.709 is amended by revising paragraph (h) to read as follows:

§ 15.709 General technical requirements.

* * * * *

(h) *Compliance with radio frequency exposure requirements.* White space devices shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of RF sources under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

PART 18 - INDUSTRIAL, SCIENTIFIC AND MEDICAL EQUIPMENT

17. The authority citation for part 18 continues to read as follows:

Authority: 4, 301, 302, 303, 304, 307.

18. Section 18.313 is added to read as follows:

§ 18.313 Radio frequency exposure requirements.

Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate.

PART 22 - PUBLIC MOBILE SERVICES

19. The authority citation for part 22 continues to read as follows:

Authority: 47 U.S.C. 154, 222, 303, 309, and 332.

20. Section 22.379 is added to read as follows:

§ 22.379 RF exposure.

Licensees and manufacturers shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements.

Technical information showing the basis for this statement must be submitted to the Commission upon request.

PART 24 – PERSONAL COMMUNICATIONS SERVICES

21. The authority citation for part 24 continues to read as follows:

Authority: 47 U.S.C. 154, 301, 302, 303, 309 and 332.

§ 24.51 [Amended]

22. Section 24.51 is amended by removing paragraph (c).

23. Section 24.52 is revised to read as follows:

§ 24.52 RF exposure.

Licensees and manufacturers shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

PART 25 – SATELLITE COMMUNICATIONS

24. The authority citation for part 25 continues to read as follows:

Authority: 47 U.S.C. 154, 301, 302, 303, 307, 309, 310, 319, 332, 605, and 721, unless otherwise noted.

25. Section 25.115 is amended by adding reserved paragraph (o) and adding paragraph (p) to read as follows:

§ 25.115 Application for earth station authorizations.

* * * * *

(p) The licensee and grantees shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. An Environmental Assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in §1.1310 of this chapter. See § 1.1307(b)(5)(ii).

26. Section 25.117 is amended by revising paragraph (g) to read as follows:

§ 25.117 Modification of station license.

* * * * *

(g) The licensee and grantees shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. An Environmental Assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or

field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter. See § 1.1307(b)(5)(iii).

* * * * *

27. Section 25.129 is amended by revising paragraph (c) to read as follows:

§ 25.129 Equipment authorization for portable earth-station transceivers.

* * * * *

(c) In addition to the information required by § 2.1033(c) of this chapter, applicants for certification required by this section shall submit any additional equipment test data necessary to demonstrate compliance with pertinent standards for transmitter performance prescribed in §§ 25.138, 25.202(f), 25.204, 25.209, and 25.216, must demonstrate compliance with the labeling requirement in § 25.285(b), and shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. An Environmental Assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

* * * * *

28. Section 25.149 is amended by revising paragraph (c)(3) to read as follows:

§ 25.149 Application requirements for ancillary terrestrial components in Mobile-Satellite Service networks operating in the 1.5/1.6 GHz and 1.6/2.4 GHz Mobile-Satellite Service.

* * * * *

(c) * * *

(3) Licensees and manufacturers shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. An Environmental Assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

* * * * *

29. Section 25.271 is amended by revising paragraph (g) to read as follows:

§ 25.271 Control of transmitting stations.

* * * * *

(g) All applicants shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. Applicants with terminals that will exceed the guidelines in § 1.1310 of this chapter for radio frequency radiation exposure shall provide a plan for mitigation of radiation exposure to the extent required to meet those guidelines. Licensees of transmitting earth stations are prohibited from using remote earth stations in their networks that are not designed to stop transmission when synchronization to signals from the target satellite fails.

PART 27 – MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

30. The authority citation for part 27 continues to read as follows:

Authority: 47 U.S.C. 154, 301, 302a, 303, 307, 309, 332, 336, 337, 1403, 1404, 1451, and 1452, unless otherwise noted.

31. Section 27.52 is revised to read as follows:

§ 27.52 RF exposure.

Licensees and manufacturers shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

PART 73 – RADIO BROADCAST SERVICES

32. The authority citation for part 73 continues to read as follows:

Authority: 47 U.S.C. 154, 155, 301, 303, 307, 309, 310, 334, 336, 339.

33. Section 73.404 is amended by revising paragraph (e)(10) to read as follows:

* * * * *

(e) * * *

(10) Licensees and permittees shall ensure compliance with the Commission's radio frequency exposure requirements in § 1.1307(b) of this chapter. An Environmental Assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter.

PART 90 – PRIVATE LAND MOBILE RADIO SERVICES

34. The authority citation for part 90 continues to read as follows:

Authority: 47 U.S.C. 154(i), 161, 303(g), 303(r), 332(c)(7), 1401-1473.

35. Section 90.223 is added to subpart I to read as follows:

§ 90.223 RF exposure.

Licensees and manufacturers shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating

under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

§ 90.1217 [Removed]

36. Section 90.1217 is removed.

PART 95 – PERSONAL RADIO SERVICES

37. The authority citation for part 95 continues to read as follows:

Authority: 47 U.S.C. 154, 303, 307.

38. Section 95.2385 is revised to read as follows:

§ 95.2385 WMTS RF exposure evaluation.

Mobile and portable devices as defined in §§ 2.1091(b) and 2.1093(b) of this chapter operating in the WMTS are subject to radio frequency radiation exposure requirements as specified in §§ 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of WMTS devices must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

39. Section 95.2585 is revised to read as follows:

§ 95.2585 MedRadio RF exposure evaluation.

A MedRadio medical implant device or medical body-worn transmitter is subject to the radiofrequency radiation exposure requirements specified in §§ 1.1307(b) and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of devices operating under this section must demonstrate compliance with these requirements using either computational modeling or laboratory measurement techniques. Where a showing is based on computational modeling, the Commission retains the discretion to request that supporting documentation and/or specific absorption rate (SAR) measurement data be submitted, as described in § 2.1093(d)(1) of this chapter.

PART 97 – AMATEUR RADIO SERVICE

40. The authority citation for part 97 continues to read as follows:

Authority: 47 U.S.C. 151-155, 301-609, unless otherwise noted.

41. Section 97.13 is amended by revising paragraph (c)(1) to read as follows:

§ 97.13 Restrictions on station location.

* * * * *

(c) * * *

(1) The licensee shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091, and 2.1093 of this chapter, where applicable. In lieu of evaluation with the general population/uncontrolled exposure limits, amateur licensees may evaluate their operation with respect to members of his or her immediate

household using the occupational/controlled exposure limits in § 1.1310, provided appropriate training and information has been accessed by the amateur licensee and members of his/her household. RF exposure of other nearby persons who are not members of the amateur licensee's household must be evaluated with respect to the general population/uncontrolled exposure limits. Appropriate methodologies and guidance for evaluating amateur radio service operation is described in the *Office of Engineering and Technology (OET) Bulletin 65*, Supplement B.

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PART 101 – FIXED MICROWAVE SERVICE

42. The authority citation for part 101 continues to read as follows:

Authority: 47 U.S.C. 154, 303.

43. Section 101.1425 is revised to read as follows:

§ 101.1425 RF exposure.

MVDDS stations in the 12.2–12.7 GHz frequency band shall ensure compliance with the Commission's radio frequency exposure requirements in § 1.1307(b) of this chapter. An Environmental Assessment may be required if RF radiation from the proposed facilities would, in combination with radiation from other sources, cause RF power density or field strength in an accessible area to exceed the applicable limits specified in § 1.1310 of this chapter.

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